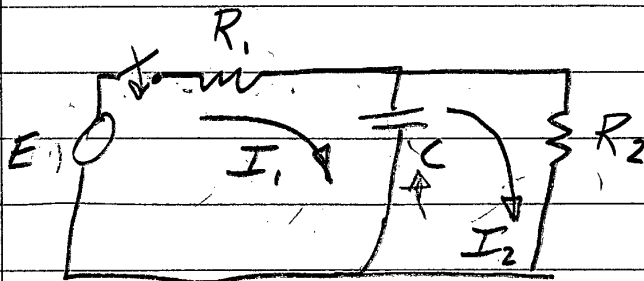


# I Band Width

This document is part of an integrated file. If separated from the file it must be subjected to individual systematic review.

1. 80 db power gain required
2. Decrease in BW ~~not~~ does not effect voltage gain.
3. Decrease in BW will decrease pulse power especially at the input where S/N power = 1.
4. Decrease in BW decreases noise.

## II



$$\frac{1}{\omega_0 C} = \frac{R_1 R_2}{R_1 + R_2} = R$$

$$\omega_0 = \frac{1}{CR} \text{ (half voltage power freq.)}$$

$$e_c = \frac{1}{C} \int I_1 dt$$

$$E_1 = I_1 R_1 + \frac{1}{C} (I_1 - I_2)$$

$$0 = I_2 R_2 + \frac{1}{C} (I_2 - I_1)$$

$$I_1 = I_2 + \mu I_2 R_2 C = I_2 (1 + \mu R_2 C)$$

$$E_1 = I_2 R_1 + \mu I_2 R_2 R_1 C + \frac{1}{C} (\mu I_2 R_2 C + I_2 - I_2)$$

$$E_1 = I_2 (\mu R_2 R_1 C + R_1 + R_2)$$

$$a \frac{dI}{dt} + bI + c = 0$$

General solution of homogeneous eq.

$$I = K \frac{a}{b} \ln(I)$$

Adding Steady State Solution

$$I = K' \frac{a}{b} - \frac{1}{a} \frac{dI}{dt}$$

apply boundary condn

when  $t = 0$   $I_2 = 0$

$t = \infty$   $I_2 = \frac{E}{R_1 + R_2}$

$$I_2 = \frac{E}{R_1 + R_2} (e^{-\frac{b}{a}t} - 1)$$

$$\frac{b}{a} = \frac{1}{RC} = \omega_0$$

$$I_2 = -\frac{E}{R_1 + R_2} (-e^{-\frac{t}{RC}} + 1)$$

Let

$$\alpha = (1 - e^{-\omega_0 t})$$

$$e^{-\omega_0 t} = 1 - \alpha$$

$$-\omega_0 t = \ln(1 - \alpha)$$

$$f_0 = \frac{\omega_0}{2\pi}$$

$$f_0 = -\frac{1}{T} \frac{\ln(1 - \alpha)}{2\pi}$$

see graph of this function.

III  $G_t \cdot f_0 = P = f_{ca}$   
Total gain per stage:

$$G = G_t \alpha \quad G_t = \frac{P}{f_0}$$

$$\alpha = (1 - e^{-2\pi f_0 t})$$

$$G = \frac{P (1 - e^{-2\pi f_0 t})}{f_0}$$

$$\frac{\partial G}{\partial f_0} = \frac{P}{f_0^2} \left[ f_0 (1 + 2\pi t e^{-2\pi f_0 t}) - (1 - e^{-2\pi f_0 t}) \right] = 0$$

$$f_0 (2\pi t e^{-2\pi f_0 t}) - 1 + e^{-2\pi f_0 t} = 0$$

$$e^{-2\pi f_0 t} (2\pi f_0 t + 1) = 1$$

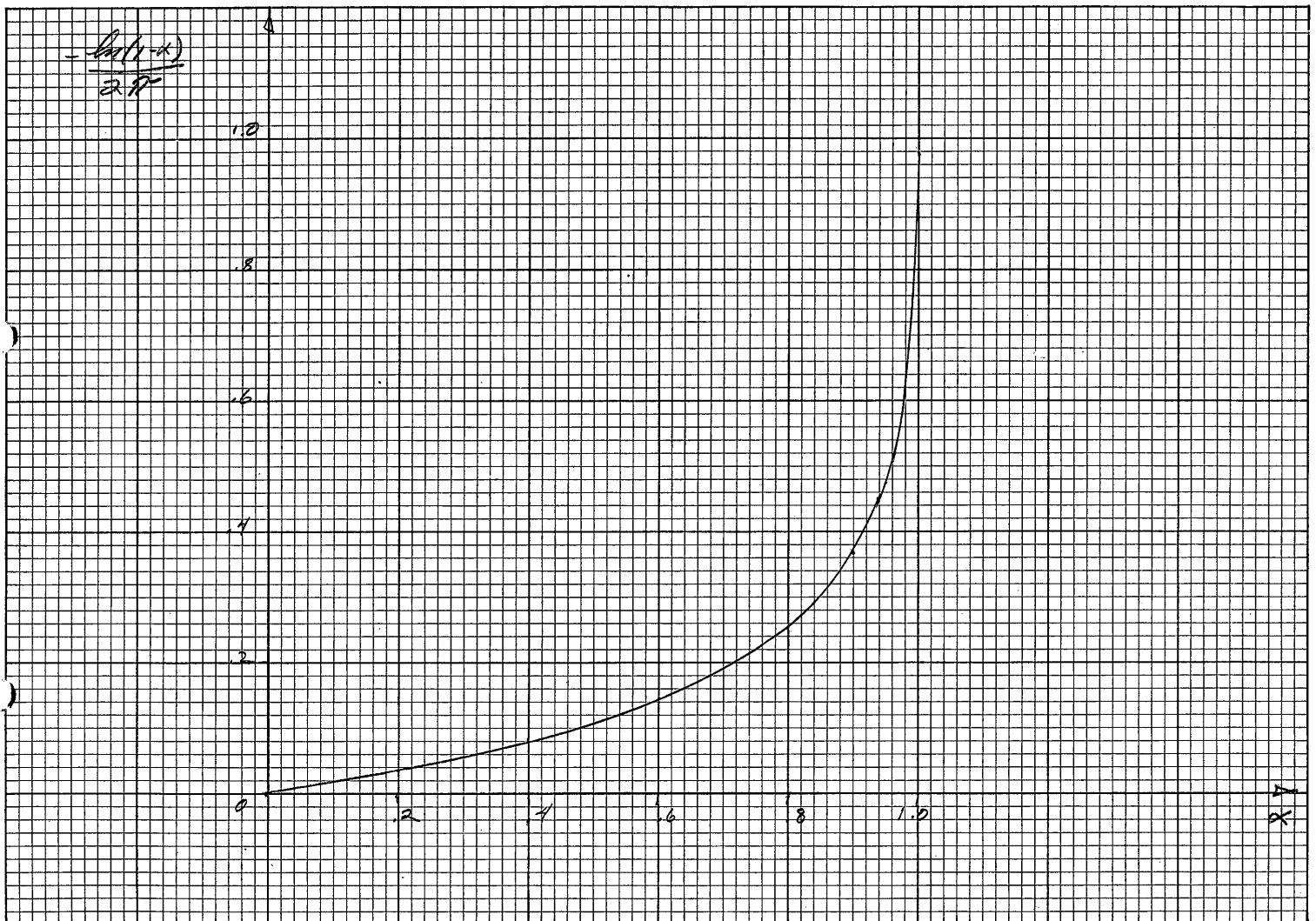
$$2\pi f_0 t + 1 = e^{2\pi f_0 t}$$

To maximize gain  $f_0 = 0$  —  
since this is the only solution  
to the above equation. This  
operates on the assumption that as  
the band width is decreased more  
gain can be achieved.

IV The minimum BW in the first stage  
should be chosen so that the noise  
power level does not exceed the  
signal power level of short pulses  
due to loss in noise side pulse area

result of stretching of the short pulse  
~~short pulse~~

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